Notice of Allowability	Application No. 10/733,526	Applicant(s) KISHI, TAKAHIKO	
	Examiner Richard Chan	Art Unit 2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *3/5/07*.
2. ☒ The allowed claim(s) is/are *1-27*.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
   1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

2. Authorization for this examiner's amendment was given in a telephone interview with John Gallagher (#47,234) on 5/11/07.

3.

The application has been amended as follows:

1. (Currently Amended) A numerical control oscillator comprising: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of a sampling frequency Fs, wherein: if an upper limit of a desired frequency setting interval of an output signal is FD and, K and L are arbitrary integers, said calculator of said phase accumulator is ~~performs~~ performing one of adding and subtracting said input phase difference data and said phase data from said register by a modulo operation taking a

nearest integer of M as a modulus, where M = Fs/FDxK/L; and said phase/amplitude conversion table outputs a signal set to a frequency setting interval of a dF step, where dF = FD/KxL.

Allowable Subject Matter

4. The following is an examiner's statement of reasons for allowance:

With respect to claim 1, Camanga Fig.4 discloses the numerical control oscillator 104 comprising: a phase accumulator 106 for accumulating input phase difference data to generate phase data, said phase accumulator 106 including a register for storing and outputting said phase data, and a calculator 108 for one of adding and subtracting said input phase difference data and said phase data from said register; (Col.5 lines 15-26) and a memory 114 for storing a phase/amplitude conversion table 116 to output amplitude data corresponding to said phase data generated by said phase accumulator 106, said numerical control oscillator 104 outputting a signal of a sampling frequency Fs, wherein: if an upper limit of a desired frequency setting interval of an output signal is FD and, K and L are arbitrary integers, said calculator 108 of said phase accumulator 106 is performs one of adding and subtracting said input phase difference data and said phase data from said register.

However the prior art does not specifically disclose wherein the a modulo operation taking a nearest integer of M as a modulus, where M=Fs/FD.times.K/L; and

said phase/amplitude conversion table outputs a signal set to a frequency setting interval of a dF step, where dF=FD/K.times.L.

With respect to claims 2 and 9, Oesch discloses the digital down-converter comprising a frequency converter 7, the frequency converter including a numerical control oscillator 34 as a local oscillator and serving to frequency-convert an input signal 2 sampled at a sampling frequency Fs, said digital down-converter converting with mixers 20 and 22 and outputting said input signal 2 into an output signal with a frequency lower than that of said input signal,

However Oesch does not specifically disclose a numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency Fs, wherein, if a desired frequency setting interval of said input signal is FD and K and L are arbitrary integers, said frequency converter is adapted to frequency-convert said input signal using a specific signal output from said local oscillator and set to a frequency setting interval of a dF step, where dF=FD/K.times.L, said local oscillator outputting the specific signal by accumulating said

phase difference data by a modulo operation taking a nearest integer of M as a modulus, where M=Fs/FD.times.K/L.

The Camnga reference however discloses a numerical control oscillator 104 having: a phase accumulator 106 for accumulating input phase difference data to generate phase data, said phase accumulator including a register 114 for storing and outputting said phase data, and a calculator 108 for one of adding and subtracting said input phase difference data and said phase data from said register.

However the prior art does not specifically disclose wherein the a modulo operation taking a nearest integer of M as a modulus, where M=Fs/FD.times.K/L; and said phase/amplitude conversion table outputs a signal set to a frequency setting interval of a dF step, where dF=FD/K.times.L.

With respect to claim 3, the prior art discloses the digital down-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency Fs1, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital down-converter converting and outputting said input signal into an output signal with a frequency lower than that of said input signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase

difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said input signal is FD and K1, K2 and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said input signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1/L1;

However the prior art fails to disclose said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs2, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=(FD mod FD1)/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/(FD mod FD1).times.K2.

Claim 4 is dependent on allowable claim 3.

With respect to claim 5, the prior art discloses the digital down-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency Fs1, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital down-converter converting and outputting said input signal into an output signal with a frequency lower than that of said input signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said input signal is FD, and K1, K2 and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said input signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1.times.L1, said first local oscillator

outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1/L1;

However the prior art fails to disclose said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs2, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=(FD1 mod FD)/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/(FD1 mod FD).times.K2.

Claim 6 is dependent on allowable claim 5.

With respect to claim 7, the prior art discloses the digital down-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency Fs1, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital down-converter converting and outputting said input signal into an output signal with a

frequency lower than that of said input signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said input signal is FD and K1, K2 and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said input signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1/L1;

However the prior art fails to disclose said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs2, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference

data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/FD.times.K2.

Claim 9 is dependent on allowable claim 8.

With respect to claim 10, the prior art discloses a digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal,.

However the prior art does not disclose a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency Fs2, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired

frequency setting interval of said output signal is FD, and K1, K2, and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2.times.L2, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/FD.times.K2/L2; and said first frequency converter is adapted to, if a sampling frequency of said input signal is Fs1, frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=(FD mod FD2)/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/(FD mod FD2).times.K1.

Claim 11 is dependent on allowable claim 10.

With respect to claim 12, the prior art discloses a digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal.

However the prior art fails to disclose a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily

frequency-convert an output signal from said first frequency converter, said digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency Fs2, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said output signal is FD and K1, K2 and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2.times.L2, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/FD.times.K2/L2; and said first frequency converter is adapted to, if a sampling frequency of said input signal is Fs1, frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=(FD2 mod FD)/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a

modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/(FD2 mod FD).times.K1.

Claim 13 is dependent on allowable claim 12.

With respect to claim 14, the prior art discloses a digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal, and a second frequency converter.

However the prior art fails to disclose the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency Fs2, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling

frequency, wherein: if a desired frequency setting interval of said output signal is FD and K1, K2 and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2.times.L2, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs2/FD.times.K2/L2; and said first frequency converter is adapted to, if a sampling frequency of said input signal is Fs1, frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1.

Claim 15 is dependent on allowable claim 14.

With respect to claim 16, the prior art discloses a receiver comprising a first frequency converter, the first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a sampling frequency Fs and a phase locked loop (PLL) circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal.

However the prior art fails to disclose a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said received signal is FD and K1, K2 and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs/FD.times.K1/L1.times.P; and said second frequency converter is adapted to, if a

sampling frequency of the output signal from said first frequency converter is Fs1, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=(FD mod FDP)/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs1/(FD mod FDP).times.K2.

Claim 17 is dependent on allowable claim 16.

With respect to claim 18, the prior art discloses a receiver comprising a first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal.

However the prior art does not disclose a second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a

frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said received signal is FD, and K1, K2, and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs/FD.times.K1/L1.times.P; and said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs1, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=(FDP mod FD)/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs1/(FDP

mod FD).times.K2.

Claim 19 is dependent on allowable claim 18.

With respect to claim 20, the prior art discloses a receiver comprising a first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal.

However the prior art fails to disclos a second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing

a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said received signal is FD, and K1, K2, and L1 are arbitrary integers, said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K1.times.L1, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs/FD.times.K1/L1.times.P; and said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is Fs1, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD2 step, where FD2=FD/K2, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs1/FD.times.K2.

Claim 21 is dependent on allowable claim 20.

With respect to claim 22, the prior art discloses a transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit

data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert the output signal from said modulator.

However the prior art fails to disclose a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said transmit signal is FD, and K1, K2, and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K2.times.L2, said second local oscillator

outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs/FD.times.K2/L2.times.P; and said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is Fs1, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=(FD mod FDP)/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/(FD mod FDP).times.K1.

Claim 23 is dependent on allowable claim 22.

With respect to claim 24, the prior art discloses a transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert the output signal from said modulator.

However the prior art fails to disclose a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a

reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, said numerical control oscillator having: a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency, wherein: if a desired frequency setting interval of said transmit signal is FD, and K1, K2, and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K2.times.L2, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs/FD.times.K2/L2.times.P; and said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is Fs1, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=(FDP mod FD)/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer

of M1 as a modulus, where M1=Fs1/(FDP mod FD).times.K1.

Claim 25 is dependent on allowable claim 24.

With respect to claim 26, the prior art discloses a transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert the output signal from said modulator.

However the prior art does not discloses wherein a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P, where P is an integer, and acting to receive the output signal from the numerical control oscillator of claim 1 as a reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, wherein: if a desired frequency setting interval of said transmit signal is FD, and K1, K2, and L2 are arbitrary integers, said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where FDP=FD/K2.times.L2, said second local oscillator outputting the first specific signal by

accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where M2=Fs/FD.times.K2/L2.times.P; and said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is Fs1, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to a frequency setting interval of an FD1 step, where FD1=FD/K1, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where M1=Fs1/FD.times.K1.

Claim 27 is dependent on allowable claim 26.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The Ahn reference (US 6,671,339) discloses a lock detecting apparatus and method for multimedia digital broadcasting receiver.

The Chiu reference (US 6,781,473) discloses a High speed low power implementation for multi-channel numerically controlled oscillator.

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard Chan whose telephone number is (571) 272-0570. The examiner can normally be reached on Mon - Fri (9AM - 5PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nay Maung can be reached on (571)272-7882. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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5/21/07

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